

WHAT IS CLAIMED IS:

- 1 1. A sprayable, fiber-reinforced, strain-hardening hydraulically
2 settable mortar, comprising:
 - 3 a) a cement fraction comprising one or more hydraulically
4 setting cements ;
 - 5 b) a strain-hardening amount and less than 4.0 volume percent
6 of matrix interactive reinforcing fibers having a length of
7 from about 4mm to about 30 mm, a fiber diameter of between
8 10 μm , and 150 μm , and interfacial chemical bonding of less
9 than 4.0 J/m²;
 - 10 c) at least one non-Newtonian additive in an amount to provide
11 a mortar viscosity such that the mortar remains pumpable and
12 sprayable, but exhibits a higher viscosity after spraying;
 - 13 d) water in a ratio of water to the hydraulically setting cement
14 fraction of 0.2:1 to 0.6:1;
 - 15 e) a superplasticizer in an amount effective to provide a
16 pumpable and sprayable mortar at the water content used;
 - 17 f) optionally a viscosity control agent in an amount of up to
18 about 5 weight percent; and
 - 19 g) optionally, aggregate in an amount up to about 200% by
20 weight relative to the weight of the sprayable mortar.
- 1 2. The sprayable mortar of claim 1, wherein said non-Newtonian
2 additive comprises an inorganic non-Newtonian additive.
- 1 3. The sprayable mortar of claim 1, wherein said non-Newtonian
2 additive comprises calcium aluminate cement.
- 1 4. The sprayable mortar of claim 1, wherein said non-Newtonian
2 additive comprises an organic polymer.

1 5. The sprayable mortar of claim 1 wherein said non-Newtonian
2 additive comprises an associative thickener.

1 6. The sprayable mortar of claim 1 wherein said reinforcing
2 fibers are present in an amount of 0.7 to 3.0 volume percent.

1 7. The sprayable mortar of claim 1 wherein said reinforcing
2 fibers are present in an amount of 1.5 to 2.5 volume percent.

1 8. The sprayable mortar of claim 1, wherein said reinforcing
2 fibers comprise one or more fibers selected from the group consisting of
3 polyarylamide fibers, high density polyethylene fibers, and polyvinylalcohol fibers.

1 9. The sprayable mortar of claim 1 which exhibits a strain of at
2 least 0.5%.

1 10. The sprayable mortar of claim 1 which exhibits a strain of at
2 least 1.0%.

1 11. The sprayable mortar of claim 1 which exhibits a strain of at
2 least 1.5%.

1 12. The sprayable mortar of claim 1, wherein said viscosity
2 control agent comprises at least one viscosity control agent selected from the group
3 consisting of modified celluloses and polyvinylalcohol.

1 13. The sprayable mortar of claim 1, comprising 1 part of cements
2 including 0.95 parts Portland cement and 0.5 part calcium aluminate cement as a
3 non-Newtonian additive, water in a water to cement ratio of 0.46, sand in a sand to
4 cement ratio of 0.80, fly ash in a fly ash to cement ratio of 0.30, carboxymethyl
5 cellulose in a carboxymethyl cellulose to cement ratio of 0.0005, superplasticizer at
6 a superplasticizer to cement ratio of 0.0075, and 2.0 volume percent polyvinyl
7 alcohol fibers.

1 14. A fiber-reinforced cementitious composite which exhibits
2 strain hardening behavior, produced by spraying the composition of claim 1 onto a
3 substrate and allowing the composition to cure.

1 15. A fiber-reinforced cementitious composite which exhibits
2 strain hardening behavior, produced by spraying the composition of claim 2 onto a
3 substrate and allowing the composition to cure.

1 16. A fiber-reinforced cementitious composite which exhibits
2 strain hardening behavior, produced by spraying the composition of claim 13 onto
3 a substrate and allowing the composition to cure.

1 17. The cementitious composite of claim 14 comprising one or
2 more overhead horizontal layers, at least one layer being at least 10 mm in
3 thickness.